New ACT systems vary in precision and bias compared to an existing gold standard

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Introduction

Heparin anticoagulation is used during percutaneous transluminal coronary angioplasty (PTCA) and cardiopulmonary bypass (CPB) to prevent clot formation. Typically, activated clotting times (ACTs) are monitored, employing minimum target ACTs to ensure adequate anticoagulation. Precise and reproducible data are required for safe monitoring but commercially available systems may differ. We compared the precision of the Actalyke ACT system(Helena Laboratories, Beaumont, TX), which uses celite, kaolin and glass beads (MaxACT) for clot activation [AL], with the Hemochron Response (Technidyne Corporation, Edison, NJ), which uses a standard celite activator [HR]. We also determined the bias of these new systems with reference to our existing ACT system (Hemochron 801, Technidyne Corporation), used clinically during PTCA and CPB.

Methods

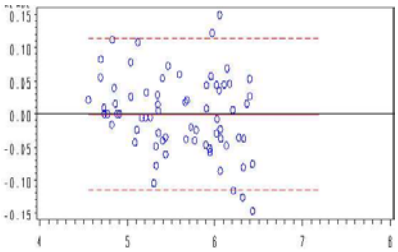
Written, informed consent was obtained from 22 patients undergoing PTCA or CPB, 80 samples drawn and ACTs ranging from 90-1096 seconds recorded. These included duplicates for AL and HR, and the 801 value used clinically. Following logarithmic transformation and confirmation of normality, Bland-Altman analysis was performed to determine difference between values. Mean difference (lower to upper limits of agreement) between values is expressed below as a percentage and shown on the graphs.

Results

Graph A: AL precision

y axis $\log_e$ of the difference between duplicates

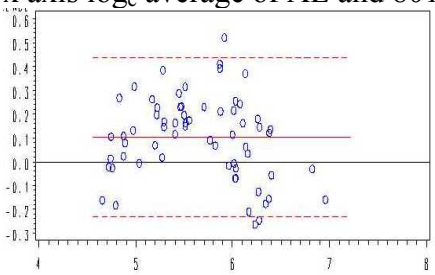
x axis $\log_e$ average of AL duplicates



Graph B: AL Vs 801 bias

y axis $\log_e$ of the difference AL - 801

x axis $\log_e$ average of AL and 801



For precision, HR duplicates were significantly different from zero –3.6%(-23 to +21%), P=0.04; AL duplicates were not –0.06%(-11 to +12%), P=0.92. AL precision is illustrated in graph A. Regarding bias, HR values showed no difference from H801: –0.5%(-30 to +43%), P=0.86. AL values were significantly less than the H801: -10.8%(-21 to +55%), P<0.001, as shown in graph B.

Conclusions

Over the quoted range, AL (graph A) demonstrated superior precision than HR. AL has previously been noted to read lower ACT values during hypothermic CPB (1). In addition, our data (graph B) show significantly lower ACT values over ranges relevant to heparin anticoagulation management during PTCA and CPB. Using AL ACT values as minimum targets in existing protocols may provide a better safety margin for avoidance of thrombogenesis during the above procedures.

References

1. Leyvi G, Shore-Lesserson L, Harrington D, et al: Investigation of a new activated clotting time "MAX-ACT" in patients undergoing extracorporeal circulation. Anesth Analg 2001;92:578-58

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